

# Electronics

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Revision as of 04:26, 6 Jul 2003; view current revision

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**Electronics** is the science and technology of electronic circuits and devices such as thermionic valves and semiconductors using the physics of electricity. This knowledge is applied in devices that manipulate electric currents and electromagnetic fields for the controlling or processing of information, or the conversion and distribution of electrical power. While electricity had been used for some time to transmit data over telegraphs and telephones, the development of electronics truly began in earnest with the advent of radio. Today, electronic devices perform a variety of tasks.

An electronic system can be divided into the following parts:

1. Inputs - Electrical or mechanical sensors (or transducers), which take signals (in the form of temperature, pressure, etc.) from the physical world and convert them into current/voltage signals.
2. Signal processing circuits - These consist of electronic components woven together to manipulate, interpret and transform the signals.
3. Outputs - Actuators or other devices (also transducers) that transform current/voltage signals back into useful physical form.

Take as an example a television. Its input is a broadcast signal received by an antenna or fed in through a cable. Signal processing circuits inside the television extract the brightness, colour and sound information from this signal. The output device is a cathode ray tube that converts electronic signals into a visible image on a screen.

See also: transducer, microelectronics, optoelectronics, semiconductor, printed circuit board, wire wrap, point-to-point construction, integrated circuit, electrical engineering, computer engineering

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## Electronic Test Equipment

- Ammeter, e.g. Galvanometer (Measure current)
- Ohmmeter, e.g. Wheatstone bridge (Measure resistance)
- Voltmeter (Measures voltage)
- Multimeter (Measures all of the above)
- Logic analyzer (Tests digital circuits)
- Oscilloscope (Measures all of the above as they change over time)
- Electrometer (Measures charge)

## Interconnecting Electronic Components

- electrical connectors, plugs and sockets etc.
- printed circuit boards
- integrated circuit
- point-to-point construction
- wire-wrap
- breadboard

## Passive Components

- resistor
- capacitor
- inductor
- transformer
- piezoelectric crystal

## Active Components (solid-state)

- diode
  - light emitting diode
  - photodiode
  - laser diode
  - Zener diode
  - Schottky diode
  - transient voltage suppression diode
  - variable capacitance diode
- transistor
  - field effect transistor
  - bipolar transistor
  - IGBT transistor
  - Darlington transistor
  - photo transistor
  - other active components
    - triac
    - thyristor
    - unijunction transistor
    - varistor

## Active Components (thermionic)

- thermionic valve
- cathode ray tube
- klystron
- magnetron

## Electromechanical Sensors and Actuators

- microphone
- loudspeaker
- strain gauge
- switch

## Thermoelectric devices

- thermistor
- thermocouple
- thermopile
- Peltier cooler

## Photoelectric devices

- light-dependent resistor

## Antennae etc.

- radio antenna

## Analog circuits

Most analog electronic appliances, such as radio receivers, are constructed from arrays of a few types of circuits.

- electronic amplifiers
- electronic filters
- electronic oscillators
- electronic mixers
- impedance matchers
- electronic power supply

## Digital circuits

Computers, electronic clocks, and programmable logic controllers (used to control industrial processes) are constructed of digital circuits. Digital Signal Processors are another example.

- logic gates
- flip-flops

- counters
- registers
- multiplexers
- microprocessors
- microcontrollers
- dsp

## Mixed-signal circuits

Mixed-signal circuits, also known as hybrid circuits, are becoming increasingly common. Mixed circuits contain both analog and digital components, analog to digital converters and digital to analog converters are the primary examples. Other examples are transmission gates and buffers.

## Noise

Associated with all electronic circuits is noise. Types of noise include

- Shot noise in resistors.
- Thermal noise in resistors.
- White noise
- Coloured noise

## External links

### Datasheets

- AMD: <http://www.amd.com/>
- Analog Devices: <http://www.analog.com/>
- Intel: <http://www.intel.com/intel/product/index.htm>
- National Semiconductor: <http://www.national.com/>
- Fairchild Semiconductor: <http://www.fairchildsemi.com/>
- ST Microelectronics: <http://eu.st.com/>
- Motorola: <http://search.motorola.com/>
- Samsung Semiconductor: <http://www.intl.samsungsemi.com/>
- Texas Instruments: <http://www.ti.com/>

- Philips: <http://www.semiconductors.philips.com>

## Datasheet Search Engines

- ChipDocs Datasheet Database: <http://www.chipdocs.com/>
- Electronic DatabookShelf: <http://www.crhc.uiuc.edu/~dburke/databooksshelf.html>
- Global Electronic Datasheet Locator: <http://www.datasheetlocator.com/>
- World of Electronics-Datasheet search: <http://www.woe.onlinehome.de/>

- The Giant Internet IC Masturbator: <http://www.falstaff.demon.co.uk/GIICM.html>

## Tutorials and Projects

- <http://www.electronics-tutorials.com/>
- <http://www.williamson-labs.com/>
- <http://my.integritynet.com.com.au/purdic>
- <http://members.nbci.com/jimas/tut.html>
- <http://www.iguanalabs.com/maintut.htm>

## Some other good sites

- IEEE: <http://www.ieee.org/>
- IEEE spectrum: <http://www.spectrum.ieee.org/>
- Electronics Express: <http://www.elexp.com/links.htm>
- Electronics Club: <http://www.cc.iitk.ac.in/~infocell/student/electronicsweb>

## Online courses

- Electronics Club (<http://www.cc.iitk.ac.in/~infocell/student/electronicsweb>) in IIT Kanpur, India

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